UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/092,136	03/06/2002	Thomas Von Der Haar	P02,0059	9032

26574 7590 09/02/2003

SCHIFF HARDIN & WAITE
6600 SEARS TOWER
233 S WACKER DR
CHICAGO, IL 60606-6473

EXAMINER
HO, ALLEN C

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 09/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N . 10/092,136	Applicant(s) DER HAAR, THOMAS VON
	Examiner Allen C. Ho	Art Unit 2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 March 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9,10 and 12-16* is/are rejected.

7)☒ Claim(s) *8 and 11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 July 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3-7, 9, and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Apte (U. S. Patent No. 5,981,959).

With regard to claim 1, Apte disclosed an x-ray detector comprising: a plurality of individual sensor elements, each sensor element including an x-ray sensitive scintillator element (**40**) which emits light dependent on x-rays incident thereon and a photo-electrical transducer (**46**, **48**, **50**) optically coupled (**45**) to the scintillator element for generating an electrical signal corresponding to the light; the sensor element being disposed in an arrangement (Figs. 3 and 4) wherein each scintillator element is adjacent to another scintillator element, the arrangement having intermediate areas (**34**) separating adjacent scintillator elements; and scintillator material disposed in the intermediate area (under **34**).

With regard to claim 3, Apte disclosed a detector as claimed in claim 1, wherein the arrangement is a matrix array (column 1, lines 20-30).

With regard to claim 4, Apte disclosed a detector as claimed in claim 1, wherein the adjacent scintillator elements are connected to each other by a compound which includes the scintillator material and which extends through the intermediate areas.

With regard to claim 5, Apte disclosed a detector as claimed in claim 4, wherein the adjacent scintillator elements and the compound are formed by a common piece of scintillator material (**38**).

With regard to claim 6, Apte disclosed a detector as claimed in claim 1, wherein the intermediate areas include an insulating area (**34**) for reducing crosstalk between the adjacent scintillator elements, and wherein the insulation area extends only partially between respective sides of the adjacent scintillator elements facing each other (Fig. 3).

With regard to claim 7, Apte disclosed a detector as claimed in claim 1, wherein the adjacent scintillator elements are connected to each other by a compound composed of scintillator material disposed in the intermediate areas, the compound having a height in the intermediate area in a range between 20% through 50% of a height of the adjacent scintillator elements (Fig. 3).

With regard to claim 9, Apte disclosed a detector as claimed in claim 1, wherein the sensor elements each have a side adapted to receive x-rays, and wherein the scintillator material is disposed in the intermediate areas at a side of the arrangement facing away from the respective sides of the sensor elements adapted to receive x-rays (Fig. 3).

With regard to claim 10, Apte disclosed a two-dimensional x-ray detector comprising: a plurality of individual sensor elements disposed in an arrangement of a plurality of intersecting rows and columns, each sensor element including an x-ray sensitive scintillator element (**40**) which emits light dependent on x-ray incident thereon and a photo-electrical transducer (**46**, **48**, **50**) optically coupled (**45**) to the scintillator element for generating an electrical signal corresponding to the light; each scintillator element in the arrangement being adjacent to another

scintillator element, the arrangement having intermediate areas (**34**) separating adjacent scintillator elements; and scintillator material disposed in at least some of the intermediate areas (under **34**).

3. Claims 1, 3-7, 9, 10, and 14-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Karellas (U. S. Patent No. 5,519,227).

With regard to claim 1, Karellas disclosed an x-ray detector comprising: a plurality of individual sensor elements, each sensor element including an x-ray sensitive scintillator element (**88**) which emits light dependent on x-rays incident thereon and a photo-electrical transducer (column 7, lines 45-55) optically coupled to the scintillator element for generating an electrical signal corresponding to the light; the sensor element being disposed in an arrangement (Fig. 3B) wherein each scintillator element is adjacent to another scintillator element, the arrangement having intermediate areas (**76**) separating adjacent scintillator elements; and scintillator material disposed in the intermediate area (under **76**).

With regard to claim 3, Karellas disclosed a detector as claimed in claim 1, wherein the arrangement is a matrix array (Fig. 2B).

With regard to claim 4, Karella disclosed a detector as claimed in claim 1, wherein the adjacent scintillator elements are connected to each other by a compound which includes the scintillator material and which extends through the intermediate areas.

With regard to claim 5, Karella disclosed a detector as claimed in claim 4, wherein the adjacent scintillator elements and the compound are formed by a common piece of scintillator material (**72**).

With regard to claim 6, Karella disclosed a detector as claimed in claim 1, wherein the intermediate areas include an insulating area (**76**) for reducing crosstalk between the adjacent scintillator elements, and wherein the insulation area extends only partially between respective sides of the adjacent scintillator elements facing each other (Fig. 3B).

With regard to claim 7, Karella disclosed a detector as claimed in claim 1, wherein the adjacent scintillator elements are connected to each other by a compound composed of scintillator material disposed in the intermediate areas, the compound having a height in the intermediate area in a range between 20% through 50% of a height of the adjacent scintillator elements (column 7, line 67; column 8, lines 1-2).

With regard to claim 9, Karella disclosed a detector as claimed in claim 1, wherein the sensor elements each have a side adapted to receive x-rays, and wherein the scintillator material is disposed in the intermediate areas at a side of the arrangement facing away from the respective sides of the sensor elements adapted to receive x-rays (Fig. 3B).

With regard to claim 10, Karella disclosed a two-dimensional x-ray detector comprising: a plurality of individual sensor elements disposed in an arrangement of a plurality of intersecting rows and columns, each sensor element including an x-ray sensitive scintillator element (**74**) which emits light dependent on x-ray incident thereon and a photo-electrical transducer (column 7, lines 45-55) optically coupled to the scintillator element for generating an electrical signal corresponding to the light; each scintillator element in the arrangement being adjacent to another scintillator element, the arrangement having intermediate areas (**76**) separating adjacent scintillator elements; and scintillator material disposed in at least some of the intermediate areas (under **76**).

With regard to claim 14, Karella disclosed a method for manufacturing a detector for detecting x-rays comprising the steps of: providing a layer of scintillating material (**72**); selectively removing (laser-based micro-machining techniques) scintillator material from the layer to produce a plurality of separating channels (**76**) with individual sensor elements respectively between the separating channels, the separating channels extending only partly through the layer to form a portion of respective intermediate areas formed by the scintillator material, each of the sensor elements having a sensor element face adapted to receive incoming x-rays, the layer having a layer side opposite to the respective faces; and disposing a plurality of opto-electric transducers (column 7, lines 45-55) at the layer side, with the opto-electric transducers being respectively optically coupled to the individual sensor elements.

With regard to claim 15, Karella disclosed a method as claimed in claim 14, comprising additionally introducing a light reflective material (**76**) into each of the separating channels.

With regard to claim 16, Karella disclosed a method as claimed in claim 16, comprising additionally introducing a light absorption material (column 7, lines 30-41) into each of the separating channels.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Apte (U. S. Patent No. 5,981,959) as applied to claim 1 above, and further in view of Hahn (U. S. Patent No. 4,969,166).

With regard to claim 2, Apte disclosed a detector as claimed in claim 1. However, Apte failed to teach that the arrangement is a linear array.

Hahn disclosed a computed tomography system comprising a fan-beam x-ray source (**1**) and a linear detector array (**2**).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the x-ray detector in a linear array, since a person would be motivated to use a linear detector array with an x-ray source that emits a fan beam.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oppelt *et al.* (U. S. Patent No. 6,005,908) in view of Apte (U. S. Patent No. 5,981,959).

With regard to claim 12, Oppelt *et al.* disclosed a computed tomography apparatus comprising: a radiation source (**1**) which emits x-rays from a focus (**11**), at least the focus being rotatable around a system axis (**10**) in a circumferential direction; a two-dimensional detector (**3**) for detecting x-rays, comprising a plurality of individual sensor elements disposed in an arrangement of a plurality of intersecting rows and columns, each sensor element including an x-ray sensitive scintillator element (**14**) which emits light dependent on x-rays incident thereon and a photo-electrical transducer (**15**) optically coupled to the scintillator element for generating an electrical signal corresponding to the light, each scintillator element in the arrangement being adjacent to another scintillator element, the rows being disposed in at least some of the

circumferential direction and the columns being disposed parallel to the system axis; and an image reconstruction system (7) for reconstructing an image from the electrical signals.

However, Oppelt *et al.* failed to teach that the arrangement having intermediate areas separating adjacent scintillator elements, and scintillator material disposed in the intermediate areas.

Apte disclosed a two-dimensional detector array, comprising a plurality of individual sensor elements disposed in an arrangement of a plurality of intersecting rows and columns, each sensor element including an x-ray sensitive scintillator element (**40**) which emits light dependent on x-rays incident thereon and a photo-electrical transducer (**46**, **48**, **50**) optically coupled to the scintillator element for generating an electrical signal corresponding to the light, each scintillator element in the arrangement being adjacent to another scintillator element, the arrangement having intermediate areas (**34**) separating adjacent scintillator elements, and scintillator material disposed in the intermediate areas (under **34**). Furthermore, Apte taught that the two-dimensional detector array having a pixelized scintillation layer provides high resolution and high conversion efficiency (column 4, lines 26-29).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ Apte's two-dimensional detector array in the computed tomography apparatus, since a person would be motivated to use a detector array that has high resolution and high conversion efficiency in order to produce a sharp reconstructed image.

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Apte (U. S. Patent No. 5,981,959) in view of King (U. S. Patent No. 4,897,788).

With regard to claim 13, Apte disclosed a method for operating a radiation detector, the method comprising the steps of reconstructing an image from the electrical signal (inherent). However, Apte failed to teach a step of taking crosstalk caused by the scintillator material in the intermediate areas into consideration in reconstructing the image.

King *et al.* disclosed a method that removes artifacts from reconstructed images by correcting for data contamination by crosstalk coupling between adjacent detectors.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to correct for crosstalk caused by the scintillator material in the intermediate areas into consideration in reconstructing the image, since a person would be motivated to remove artifacts from reconstructed images.

8. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Karellas (U. S. Patent No. 5,519,227) as applied to claim 1 above, and further in view of Hahn (U. S. Patent No. 4,969,166).

With regard to claim 2, Karellas disclosed a detector as claimed in claim 1. However, Karellas failed to teach that the arrangement is a linear array.

Hahn disclosed a computed tomography system comprising a fan-beam x-ray source (**1**) and a linear detector array (**2**).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the x-ray detector in a linear array, since a person would be motivated to use a linear detector array with an x-ray source that emits a fan beam.

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oppelt *et al.* (U. S. Patent No. 6,005,908) in view of Karellas (U. S. Patent No. 5,519,227).

With regard to claim 12, Oppelt *et al.* disclosed a computed tomography apparatus comprising: a radiation source (**1**) which emits x-rays from a focus (**11**), at least the focus being rotatable around a system axis (**10**) in a circumferential direction; a two-dimensional detector (**3**) for detecting x-rays, comprising a plurality of individual sensor elements disposed in an arrangement of a plurality of intersecting rows and columns, each sensor element including an x-ray sensitive scintillator element (**14**) which emits light dependent on x-rays incident thereon and a photo-electrical transducer (**15**) optically coupled to the scintillator element for generating an electrical signal corresponding to the light, each scintillator element in the arrangement being adjacent to another scintillator element, the rows being disposed in at least some of the circumferential direction and the columns being disposed parallel to the system axis; and an image reconstruction system (7) for reconstructing an image from the electrical signals.

However, Oppelt *et al.* failed to teach that the arrangement having intermediate areas separating adjacent scintillator elements, and scintillator material disposed in the intermediate areas.

Karellas disclosed a two-dimensional detector array, comprising a plurality of individual sensor elements disposed in an arrangement of a plurality of intersecting rows and columns, each sensor element including an x-ray sensitive scintillator element (**74**) which emits light dependent on x-rays incident thereon and a photo-electrical transducer (column 7, lines 45-55) optically coupled to the scintillator element for generating an electrical signal corresponding to the light, each scintillator element in the arrangement being adjacent to another scintillator element, the arrangement having intermediate areas (**76**) separating adjacent scintillator elements, and scintillator material disposed in the intermediate areas (under **76**). Furthermore, Karellas taught

that the two-dimensional detector array having a pixelized scintillation layer provides high sensitivity and high resolution (column 2, lines 48-50).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ Karellas's two-dimensional detector array in the computed tomography apparatus, since a person would be motivated to use a detector array that has high sensitivity and high resolution in order to produce a sharp reconstructed image.

10. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Karellas (U. S. Patent No. 5,519,227) in view of King (U. S. Patent No. 4,897,788).

With regard to claim 13, Karellas disclosed a method for operating a radiation detector, the method comprising the steps of reconstructing an image from the electrical signal (inherent). However, Apte failed to teach a step of taking crosstalk caused by the scintillator material in the intermediate areas into consideration in reconstructing the image.

King *et al.* disclosed a method that removes artifacts from reconstructed images by correcting for data contamination by crosstalk coupling between adjacent detectors.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to correct for crosstalk caused by the scintillator material in the intermediate areas into consideration in reconstructing the image, since a person would be motivated to remove artifacts from reconstructed images.

Allowable Subject Matter

11. Claims 8 and 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. The following is a statement of reasons for the indication of allowable subject matter:

With regard to claim 8, although the prior art discloses a detector as claimed in claim 7, it fails to teach that a mathematical product of the height of the compound in the intermediate areas and the x-ray absorption coefficient have a value in a range between 0.15 and 0.50.

With regard to claim 11, although the prior art discloses a detector as claimed in claim 10, it fails to teach or fairly suggest that respective intermediate areas between adjacent columns of the sensor elements are free of scintillator material.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

(1) Nakamura *et al.* (U. S. Patent No. 5,831,269) disclosed a radiation detector comprising intermediate areas (**20**).

(2) Tran *et al.* (U. S. Patent No. 5,418,377) disclosed a pixelized phosphor screen.

(3) Ryuo *et al.* (U. S. Patent No. 5,227,633) disclosed a joined scintillator block body for radiation detector.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (703) 308-6189. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (703) 308-4858. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0530.

ACH

Allen C. Ho

Allen C. Ho
Patent Examiner
Art Unit 2882